



Identifying the mechanisms through which behavioral weight-loss treatment improves food decision-making in obesity



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ABSTRACT

Objectives: Behavioral weight loss (BWL) programs are the recommended treatment for obesity, yet it is unknown whether these programs change one's ability to use self-control in food choices and what specific mechanisms support such change. Using experimental economics methods, we investigated whether changes in dietary behavior in individuals with obesity following BWL are driven by one or more of the following potential mechanisms: changes in the perception of the 1) health or 2) taste of food items, and/or 3) shifting decision weights for health versus taste attributes. Therefore, we compared these mechanisms between obese participants and lifetime normal weight controls (NW) both before and after BWL.

Methods: Females with obesity ($N = 37$, mean BMI = 33.2) completed a food choice task involving health ratings, taste ratings, and decision-making pre- and post-standard BWL intervention. NW controls ($N = 30$, BMI = 22.4) completed the same task.

Results: Individuals with obesity exhibited increased self-control (selecting healthier, less tasty food choices) post-treatment. However, their rates of self-control remained significantly lower than NW. We found no differences in initial health perceptions across groups, and no changes with treatment. In contrast, taste ratings and the relative value of taste versus health decreased following treatment. Although, post-treatment participants continued to perceive unhealthy foods as tastier and used less self-control than NW controls, they showed significant improvements in these domains following a BWL intervention.

Conclusions: To help individuals improve dietary decisions, additional research is needed to determine how to make greater changes in taste preferences and/or the assignment of value to taste versus health attributes in food choices.

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1. Introduction

Behavioral approaches are recommended as the treatment of choice for mild and moderate obesity (Jensen et al., 2013). These approaches, which help individuals make healthier choices for eating and activity a part of their regular lifestyles (Wing, 2002), typically produce weight losses averaging 7–10% of initial body weight at 6–12 months, although the long-term success of these

interventions is lower (Jeffery et al., 2009; Sarwer, von Sydow Green, Vetter, & Wadden, 2009; Turk et al., 2009; Wing, Crane, Thomas, Kumar, & Weinberg, 2010).

Recent studies have shown benefits of behavioral weight loss intervention (BWL) on dietary composition (Raynor et al., 2015), however, the specific mechanisms through which BWL leads to healthier dietary choices remain unclear. Specifically, do BWL programs increase “self-control” over food choices when faced with a concrete challenge, i.e. selection of healthier options over tastier but less healthy food choices, and, if so, what are the mechanisms supporting this change?

Basic decision-making theories suggest three mechanisms could be altered by participation in BWL and subsequently lead to a healthier diet. First, the interventions might change participants'

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perceptions about the healthiness of foods. For example, participants might become more knowledgeable about nutrition or more realistic about the dangers of eating specific unhealthy foods like cookies, and the benefits of eating specific healthy foods like broccoli. Indeed, some previous studies have demonstrated improvements in nutrition knowledge through weight loss interventions (Brinberg, Axelson, & Price, 2000), especially in lower income populations (Klohe-Lehman et al., 2006; Rustad & Smith, 2013). However, although greater knowledge has been linked to better diet quality (Wardle, Parmenter, & Waller, 2000), a large body of previous literature suggests nutrition knowledge does not differ between individuals with overweight/obesity and those with normal weight (O'Brien and Davies, 2007; Axelson, Federline, & Brinberg, 1985; Shepherd & Stockley, 1987; Shepherd & Towler, 2007; Towler & Shepherd, 1992; Stafleu, Van Staveren, De Graaf, Burema, & Hautvast, 1996). Treatment seeking individuals with obesity typically possess adequate nutrition and diet knowledge (Kaufer-Horwitz et al., 2015) and nutrition knowledge is not sufficient to induce changes in dietary choices (Crites & Aikman, 2005). Taken together, these previous findings diminish the probability that improvements in health knowledge alone will improve food choices; therefore we do not expect that the behavioral weight loss intervention will alter health perceptions and individuals with obesity will perceive food health similarly to those with normal weight. Nonetheless, we tested for this possible effect in our sample.

Second, these programs might change participants' taste perceptions of different foods. In particular, participants might learn to like healthy foods and/or dislike the taste of unhealthy items. Taste preferences have been shown to change with weight loss. For instance, preference for fat diminishes after following a lower fat diet (Ledikwe et al., 2007; Mattes, 1993). Evidence also suggests that food liking may differ as a function of BMI, as greater BMI has been shown to correlate with preference for fatty foods (Bartoshuk, Duffy, Hayes, Moskowitz, & Snyder, 2006; Deglaire et al., 2015; Duffy et al., 2007, 2009; Mela & Sacchetti, 1991; Nakamura, Shimai, Kikuchi, & Tanaka, 2001). Moreover, individuals with obesity exhibit greater desire for the foods they find tasty, and report thinking about food more often than lean individuals, even in the absence of metabolic hunger (Schultes, Ernst, Wilms, Thurnheer, & Hallschmid, 2010). Thus we hypothesized that individuals with obesity and normal weight controls will differ in taste preferences and that taste ratings will decrease following treatment, but it is unknown whether these changes will make post-treatment taste ratings equal to those of normal weight individuals.

Third, beyond potential changes in perception, the interventions might also increase the relative weighting given to health versus taste at the time of choice (Hare, Camerer, & Rangel, 2009). Hare and colleagues demonstrated that healthy eaters differ from unhealthy eaters in the weight placed on health versus taste attributes. Cognitive-behavioral strategies targeted in BWL, such as goal-setting, may help individuals with overweight/obesity modulate their valuation of health over taste, however, such explicit differences in the relative weighting of taste and health at the time of food decisions have not been systematically assessed in those with obesity versus lean individuals, nor examined before and after a BWL intervention, nor has it been determined whether BWL improves self-control in food decision-making.

Here we combine a paradigm from experimental economics (Hare et al., 2009) with an evidence-based BWL intervention to examine whether individuals with obesity (OB) exhibit greater self-control in food choice decision-making following treatment, and the mechanisms related to this change. We also examine whether food-related decision-making in the OB group post-treatment is

more similar to that of normal weight individuals (NW). It is hypothesized that individuals with obesity will increase their use of self-control in food choices following treatment, and based on the above information it is hypothesized that health perceptions will not contribute these changes while taste perceptions may serve as a mechanism for healthier dietary choice. It is further hypothesized that individuals with obesity will place greater value on health rather than taste following the BWL treatment.

2. Methods

2.1. Participants

Women were recruited for this study based upon weight status for either the obese group (OB, $N = 37$) or lifetime normal weight (NW, $N = 30$). A total of 54 women with obesity were recruited via self-referral in response to Internet advertisements within the Lifespan Corporation and community postings to participate in a BWL intervention research study at the Weight Control and Diabetes Research Center in Providence, RI. From this sample 37 women with obesity (OB; mean BMI = 33.2; mean age = 47.1) completed the food choice decision-making task both pre- and post-treatment and are included in the current study. Thirty normal weight women (NW; mean BMI = 22.4; mean age = 44.1) who reported being within the normal weight range (BMI 18.5–24.9) throughout their lifetime (excluding pregnancies) were recruited in the same way (i.e., self-referral in response to Internet and community postings seeking women of healthy weight for a research study) for comparison and completed the same task. The sample was restricted to females for multiple reasons. In order to keep sex constant between participant groups, given the disproportionate number of females versus males typically presenting for behavioral weight loss treatment, only females were included. Moreover, previous research employing the food choice decision-making task has focused on females and it is possible there are differences in mechanisms supporting food choice between sexes. All participants were weight stable upon enrollment in the study (defined as within ± 5 lbs. for the past two months) and reported no history of eating disorders. Additionally, a sample of 5 professional licensed nutritionists completed health ratings (described below) to provide expert assessment. Each participant provided informed consent in accordance with the guidelines set by the Institutional Review Boards of The Miriam Hospital and Brown University and received monetary compensation for completing assessments.

2.2. Clinical intervention

Individuals in the OB group participated in a BWL intervention incorporating diet, exercise, and behavioral therapy and instructed by Master's and Doctorate-level interventionists. Interventions were conducted via face-to-face group meetings ($n = 31$) or via the Internet ($n = 6$) and varied in duration from 12 weeks ($n = 18$) to 16 weeks ($n = 19$). Core content of the intervention was the same for both the face-to-face and Internet-delivered programs and both durations (12 or 16 weeks). All participants were given the goal of losing 1–2 pounds per week. To help achieve this goal participants were placed on a caloric and fat restricted diet (e.g., 1200–1500 kcal/day depending on initial weight, <30% of calories from fat) and were encouraged to increase their physical activity gradually each week to reach at least 200 min per week (using activities similar in intensity to brisk walking in bouts ≥ 10 min). No foods or medications were provided via the intervention. All participants received a fat/calorie guidebook and a diary in which to self-monitor weight, food consumption, and physical activity. All participants were instructed on how to carefully weigh and

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